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wire netting; the lower having a strong and coarse mesh, and designed to give strength to the upper netting which determines the size of material which can be washed through. The end pieces are of wood. A rectangular box fitting into the top of this sieve, and having a coarse wire bottom, is sometimes employed for the purpose described below in the next pattern. The table sieve was the joint invention of Professor Verrill and Capt. Chester in 1877, and was originally intended to receive the contents of the trawl which had been previously dumped upon the deck. It consists of a large rectangular wooden frame, supported upon legs of a convenient height, and with a bottom of heavy galvanized wire-netting which serves to support the real bottom of the sieve. This is of fine wire-netting fitted to a removable frame. Above this is a second, hopper-shaped frame-work, covered underneath with

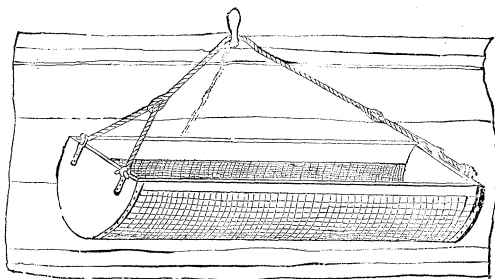


FIG. 5.—VERRILL'S CRADLE SIEVE.

coarse netting, and provided at about the middle of the side with cleats which rest upon the upper edges of the main frame when the three frames are nested together for use. The trawls are emptied into the hopper frame, which retains the coarser objects, allowing the smaller and generally more delicate specimens to be washed out on to the finer netting below. This arrangement of sieves has been found to give greater satisfaction than any other for washing large quantities of material, and keeps the specimens in better condition. The under part of the main frame is covered with heavy canvas, which serves to direct the water to the canvas tube in the centre, and thence over the side of the vessel.

Mr. James E. Benedict, naturalist on the steamer Albatross, has recently added an interesting feature to this sieve, for collecting and cleaning the foraminifera taken in the trawls, and of which many quarts were frequently washed away and lost by the old method at every haul. The canvas tube is simply

arranged to lead into the side of a cask placed close to the sieve, and from which the water escapes at a slightly higher level on the opposite side. The heavier particles carried through the tube by the great force of the current are thereby given a chance to settle in the cask; the lighter sediment, composed mostly of fine mud, passing off through the outlet. After the washing has been accomplished, the water remaining in the barrel is decanted or drawn off through a siphon. The washing, in both the cradle and table sieves, is accomplished by means of a stream of water supplied through a hose. The large sieve figured on the deck of the French steamer *Talisman* in a recent number of *La nature* (see *Science*, vol. iii. p. 453) appears to partake of the character of the table sieve above described, although its details are not shown.

RICHARD RATHBUN.

KAFIRISTAN.

THE adventurous journey of Macnair, disguised as a native physician, into Kafiristan has given us the first testimony of a European eye-witness to the characteristics of that country and its inhabitants. Without recounting the itinerary, or specially detailing the perils of the traveller, which were not few, it may be mentioned that a part of his route lying between Mirga and Lowerai Kotal was at an altitude of 10,450 feet above the sea-level, winding through the snow between heaps of stones, which cover the remains of Mohammedans assassinated by the Kafirs. Elphinstone relates, in his 'History of Kabul,' that, on the occasion of a sacrifice, the prayer offered was, "Defend us from fever, increase our wealth, kill the Mussulmans, and after our death admit us to Paradise." It appears that none of their religious duties are better attended to by the Kafirs than that of killing the Mussulmans. Much the same importance is attached to it as belonged to head-hunting among the Dyaks, and no young Kafir is allowed to marry until he has killed at least one. A very similar feeling would seem to exist towards Europeans.

Kafiristan embraces an area of some five thousand square miles, limited to the north by the stupendous crest of the Hindu Kush, of which at least one peak rises above twenty-five thousand feet; on the south by the Kunar range; and on the east and west chiefly by the Alishang and Kunar rivers. Three distinct tribes—the Ramgals, Vaigals, and Bashgals—correspond to and occupy the three principal valleys of the country, the last being subdivided into five clans. The Vaigals are reputed to be the most numerous, and occupy the largest valley. Each tribe has a distinct dialect, but all have many words in common. In general, the three tribes have few relations with each other. Altogether, they are supposed to number about two hundred thousand people.

The country is wild, picturesque, and densely wooded. The men are fine-looking. Blue eyes are rare, but brown ones, and light, or even reddish hair, are common. The complexion varies from a ruddy blond to a bronze color, which is, doubtless, partly due to exposure. Their stature is but moderate. The men are fearless but lazy, and leave the work of agriculture to the women. When not at war they hunt. They are devoted to the dance, with which they occupy most of their evenings. The dance in use is invariably initiated by a woman, who goes through a prelude of graceful posturing. At a given signal, the dancers take their places on either side of the fire; the musicians, with a drum, flutes, and cymbals, taking a place at the end of the lines. At a second signal, couples form, and later turn singly around the fire. The dance terminates by a new formation of couples, holding a stick between them, feet firmly planted and close together, when they turn with great rapidity, first from right to left, and then in the reverse direction.

The houses are constructed on the mountain-side. The ground-floor is of stone, ten or twelve feet high, and is not used, except for storing wood and dry dung, both used for fuel, the latter especially in the preparation of cheese, which is made daily, and is of good quality. Above the stone foundation the structure is entirely of wood, with a sort of gallery around it. There are but two rooms, clean but very dark. The door-jambs are rudely carved. There is little furniture, but chairs of wood or wicker are in general use. The ordinary food is composed of bread and cheese in a sort of sandwich, dipped in melted butter, and boiled meat. The beds are built like a bunk attached to the wall. Some houses are provided with two stories, both of similar construction. The roof is made of flat stones, covered with a coating of clay.

The temples comprise a single square room, in which there are some large water-worn stones taken from the bed of the river, but no idols, except certain figures used in the funeral ceremonies be so considered. The dead are taken in their coffins into the temple, where sacrifices are made, and the remains then carried to the appointed place in the cemetery, but they are not buried. As to religion, the Kafiri believe in a passive supreme being, and a very active devil to whom all mischances are ascribed.

The men shave the head, except a single long lock on the summit, and go uncovered. Their dress is much like that of the Afghans, chiefly of cotton, with leather buskins made of laced strips of hide. The women wear the hair long, coiled under a large bonnet, through the top of which two tufts of hair project, looking at a distance like horns. Slavery is practised. Polygamy is exceptional. The unfaithful wife is beaten, and her lover fined not less than six head of cattle, and more according to his means. They have been supposed to be great wine-bibbers; but Mr. Macnair found in use only grape-juice, neither fermented nor distilled. This is pressed out during the vintage, and kept in jars under ground until needed. They are armed with the bow and

arrow and a few matchlocks. The traveller observed artificial ponds, made to entice the wild ducks who pass over in their annual migrations. Some of the rivers carry gold; but the chiefs oppose washing for it, having in view the inevitable consequences to which successful gold-mining would give rise.

The people are intensely jealous of European invasion. The mere suspicion of European origin several times put the life of Mr. Macnair in serious danger, and intended journeying in several directions was given up as unsafe on this account.

THE CHANGES WHICH FERMENTATION PRODUCES IN MILK.¹

MILK, if left standing a short time, becomes a sort of acidulated jelly called curd. In cheese-making this transformation is hastened by bruising; but in both cases the acidity and the peculiar savor of the curdled milk are caused by a microbe, the lactic bacillus, whose little rods are swimming by millions in the turning liquid. Only the caseine, the albuminous portion of milk, which forms the principal ingredient of cheese, coagulates: the lactic bacillus, recently studied by Mr. Hueppe, avoids this, and prefers the sugar of the milk, which it changes into a lactic acid. Without the bacillus, the milk would not sour. If milk, when fresh, is carefully poured into sterilized flasks, and corked, it may be preserved indefinitely. Repeated warmings have the same effect; but the operation is too delicate to be of practical value. If we touch curdled milk with the point of a pin, and then plunge the point into fresh milk, in a few hours this milk will also be curdled. This pin-point carries the lactic bacilli in sufficient quantities to sow any quantity whatever of the milk-food. By introducing other microbes, milk will undergo a number of dissimilar transformations, according to the germs which are sown in it. The germs of the butyric bacillus condense the milk without its becoming acidulated: on the contrary, it will have an alkaline reaction, with a bitter taste, and an odor resembling that of fresh cheese or whey. By adding a little blue milk, in a few hours the whole becomes blue. The milk neither curdles nor sours, but a drop examined under the microscope is seen to swarm with vibrios. This is the cyanogen bacillus; and when sown in glue, in potato, or in soup, it everywhere multiplies, and makes the substance blue. At times this bacillus causes an eruption, which is cured with much difficulty. Milk is not rendered unwholesome by it, nor disagreeable in taste; but it is blue, which does not increase its market-value. A little ropy milk added will in three days make milk so thick that we can invert a bottle containing it without losing a single drop. In this case a peculiar microbe, a micrococcus, has been at work. This has been described by Mr. Schmidt-Mulheim, who deserves a place of honor among confectioners; for he has discovered a method of producing

¹ Abridged from an article by Dr. H. FOL, in the *Journal de Genève*.